THE ORIGIN OF THE YEAR.[1]

III.

IN the previous articles I have endeavoured to show that the Egyptians had the Sirius year and the vague year so related to each other that the successive coincidences of the 1st Thoth in both years took place after intervals of 1460 Sirian years. With a real year, the length of which would be brought home to them by the regular recurrence of the solstices and Nile flood (to say nothing of the equinoxes) and the year of 360 days which they would soon find to be quite artificial and unreal; they would be much more likely to refer the dates in the artificial year to the real one, than to take the opposite course, and, as I have shown, the artificial dates would sweep backwards through the real ones. Such a method of reckoning, however, would be useless for calendar purposes, as they not only wanted to define the days of the year but the years themselves, and I pointed out that something more was necessary, and that an easy way of defining *years* would be to conceive a great year, or *annus magnus*, consisting of 1460 years, each "day" of which would represent four years in actual time; and further to consider every event, the year of which had to be chronicled in relation to others to take place on the day of the heliacal rising of Sirius or the nearly coincident Nile flood, which, as we shall see, occurred, at different periods of Egyptian history, on the 1st Thoth and 1st Pachons.

A diagram, which may here be repeated, was given to show how such a system would work. From any coincidence of 1st Thoth (or 1st Pachons) in both the Sirian and the vague year, since the vague year is the shorter, the 1st Thoth (to deal only with Thoth) of the vague year would recede; so that in such a cycle it would fall first among the Epacts, then in Mesori, and so on through the months, till the next coincidence was reached.

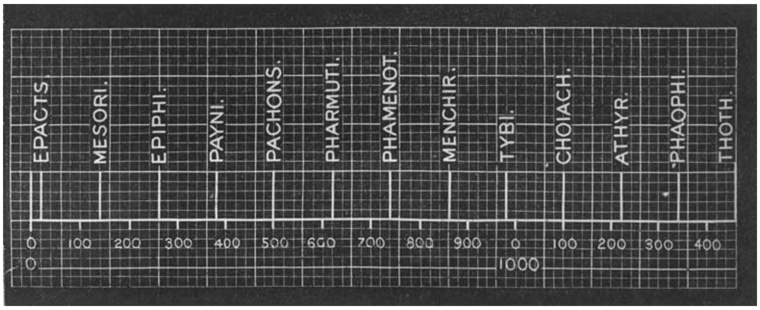

FIG. 5.—The distribution of the 1st of Thoth (representing the rising of Sirius) among the Egyptian months in the 1460 year Sothic cycle.

The diagram will show how readily the cycle year can be determined for any vague year. If for instance the 1st Thoth in the vague year falls on 1 Tybi of the cycle, we see that 980 years must have elapsed since the beginning of the cycle, and so on.

Here, then, we have a true calendar system; if the Egyptians had not this, what had they?

Such a calendar system as this it will be seen, however, is good only for groups of four years. Thus during the first four years of a cycle the 1st Thoth vague would happen on 1st Thoth of the cycle, during the next four years on the 5th Epact, and so on.

Now a system which went no further than this would be a very coarse one. We find, however, that special precautions were taken to define which year of the four was in question. Brugsch[2] shows that a special sign was employed to mark the first year of each series of four.

Now as a matter of fact it is known (I have the high authority of Dr. Krall for the statement) that each king was supposed to begin his reign on the 1st Thoth (or 1st Pachons) of the particular year in which that event took place, and the fact that this was so supports the suggestion we are considering. During the reign its length and the smaller events might be recorded in vague years and days so long as the date of its commencement had been referred to a cycle.

We have next to consider more especially the vague year.

One argument which has been used to show that a vague year was not in use during the time of the Ramessids has been derived from some inscriptions at Silsilis which refer to the dates on which sacred offerings were presented there to the Nile-god. As the dates 15th of Thoth and 15th of Epiphi are the same in all three inscriptions, although they cover the period from Ramses II. to Ramses III.—120 years—it has been argued by Brugsch that a fixed year is in question.

Brugsch points out that the two dates are separated by 65 days; that this is the exact interval between the Coptic festivals of the commencement of the flow and the marriage of the Nile—the time of highest water; and that, therefore, in all probability these are the two natural phenomena to commemorate which the offerings on the dates in question were made.

But Brugsch does not give the whole of the inscription. A part of it, translated by De Rougé,[1] runs thus:—

"I (the king) know what is said in the depot of the writings which are in the House of the Books. The Nile emerges from its fountains to give the fullness of life-necessaries to the gods," &c.

De Rougé justly remarks: "Le langage singulier que tient le Pharaon dédicateur pourrait même faire soupçonner *qu'il ne s'agit pas de la venue effective de l'eau sainte du Nil à l'une des deux dates précitées.*"

Krall (*loc. cit.* p. 51) adds the following interesting remarks:—"Consider, now, what these 'Scriptures of the House of Life' were like. In a catalogue of books from the temple of Edfu, we find, besides a series of purely religious writings, 'The knowledge of the periodical recurrence of the double stars (sun and moon),' and the 'Law of the periodical recurrence of the stars.'

"... The knowledge embodied in these writings dated from the oldest times of the Egyptian empire, in which the priests placed, rightly or wrongly, the origin of all their sacred rolls" (cf. Manetho's 'History," p. 130).

Now to investigate this question we have to approach some considerations which at first sight may seem to be foreign to our subject. I shall be able to show, however, that this is not so.

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[1] Continued from vol. xlvi. p. 107.

[2] "Matériaux pour servir à la reconstruction du calendrier," p. 29.

[1] "Aeg. Zeit," 1886, p. 5, quoted by Krall.

Imprimis we must remember that it is a question of Silsilis, where we know both from tradition and geological evidence, in ancient times the first cataract was encountered. The phrase "The Nile emerges from its fountains" would be much more applicable to Silsilis, the seat of a cataract than as it is at present. We do not know when the river made its way through this impediment, but we do know that after it took place and the Nile stream was cleared as far as the cataract that still remains at Elephantine, a Nilometer was erected there, and that during the whole of later Egyptian history at all events the time of the rise of the river has been carefully recorded both there and at Rhoda.

From this it is fair to infer that in those more ancient times the same thing took place at Silsilis; if this were so the reason of the record of the coming of the inundation at Silsilis is not far to seek, and hence the suggestion lies on the surface that the records in question may state the date of the arrival *in relation to Memphis time.*

So far in my inquiries I have not been able to find a complete discussion of the influence upon local calendars, in different parts of the Nile valley, of the variations of the phenomena upon which the Egyptians depended for the marking of New Year's day.

If the *solstice* had been taken alone, the date of it would have been the same for all parts of the valley; but certainly the solstice was not taken alone, and for the obvious reason that they wanted something to warn them of the Nile rise, and in the lower reaches of the river the rise precedes the solstice.

Nor was the heliacal rising of Sirius taken alone.

As we have seen, according to Biot the heliacal rising of Sirius *at the solstice* took place on July 20 (Julian) in the year 3285 B.C.; and according to Oppolzer, it took place on July 18 (Julian) in the year 3000 ± B.C.

But this is too general a statement, and it must be modified here. There was a difference of 7 days in the date of the heliacal rising, according to the latitude, from southern Elephantine and Philæ, where the heliacal rising at the solstice was noted first, to northern Bubastis. There was a difference of four days between Memphis and Thebes, so that the connection between the heliacal rising and the solstice depended simply upon the latitude of the place. The further south, the earlier the coincidence occurred.

Here we have an *astronomical* reason for the variation in the date of New Year's day.

But it was chiefly a question of the arrival of the Nile flood, and the date of the commencement of the Nile flood was by no means common to all parts of Egypt!

I cannot find any statement of the dates of the arrival of any one Nile flood at places between Elephantine and Cairo. Dr. Wallis Budge[1] states: "The indications of the rise of the river may be seen at the cataracts as early as the end of May."

Now if we take the 1st cataract to be here meant, and deal with May 31; since the average day of arrival of the inundation at Cairo is 3 days after the solstice—that is June 20 (Greg.)—we have 24 days for the flood-travel for the 600 miles between Elephantine and Cairo, four-fifths of a month elapsing between the times at which the Green Nile colours the pool at Syene below the Cataracts, and the river at Memphis; so that the further south, the earlier the flood was noted. This gives us about a mile an hour. This certainly seems too slow.

But if we assume 16 days, this would give us about 15 days between Silsilis and Cairo, and 12 days between Thebes and Cairo, taking Cairo to represent the ancient Memphis. Now this represented a difference in the new year's days of different places, compared to which our modern differences of local time sink into insignificance, for they only touch hours of the day; and the reason that I have referred to them here is to point out that if the assumption made is anything like accurate, if, for instance, in Pepi's time a Nile rise were observed at Silsilis, there might easily be a difference of 15 days between the rise of the Nile at Silsilis and the Memphic 1st of Thoth. If both at Silsilis and Memphis the Nile rise marked 1st Thoth, the day of the rise at Memphis would correspond to 15th Thoth at Silsilis, so that a king reaching Silsilis with Memphis local time, would be struck with this difference, and anxious to record it, may not this then have been the important datum recorded in the sacred books? If so, it would not touch the question of the fixed or vague year at all.

Let it, then, be for the present conceded that there was a vague year, and that at least some of the inscriptions which suggest the use of only a fixed year in these early times may be explained in another way. I do not say the above explanation is the correct one, for the assumption of 16 days may be wrong, even if difference in the dates of the heliacal rising at the two places be taken into account.

The dates we have found—trying to take the very simplest way of writing a calendar in pre-temple times, and using the calendar inscriptions in the most natural way—are for the coincidence of the heliacal rising of Sirius at, or near, the solstice—

270 B.C.
1728 B.C.
3192 B.C.

Now here we meet with a difficulty which, if it cannot be explained, evidently proves that the Egyptians did not construct and use their calendar in the way we have supposed.

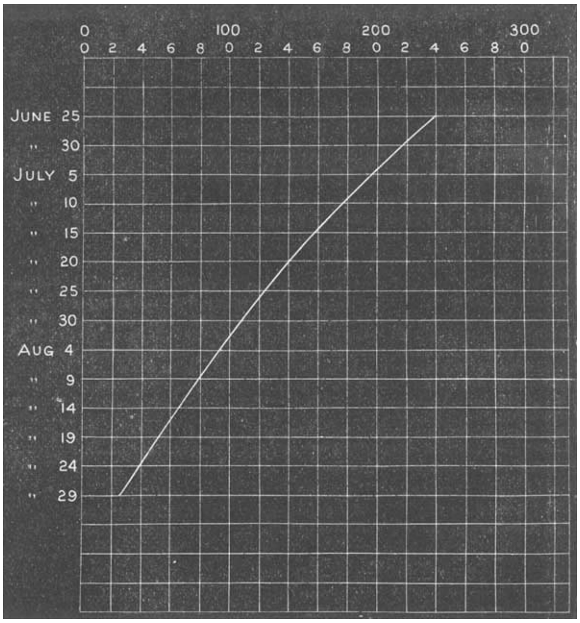

FIG. 6.—Julian dates of the 1st of Thoth (vague) from 23 A.D. to 240 A.D.

We have it on the authority of Censorinus that a Sothic period was completed in 139 A.D., and that there was then a vague year in partial use. It is here that the work of Oppolzer is of such high value to us. He discussed all the statements made by Censorinus, and comes to the conclusion that his account is to be depended upon. It has followed from the inquiries of chronologists that in this year the 1st of Thoth took place on July 20 (Julian), the date originally of the heliacal rising of Sirius, the beginning of the year.

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[1] "The Nile," p. 46

This being so, then, in the year 23 A.D.—in which the Alexandrine reform of the calendar, of which more presently, was introduced—the 1st of Thoth would take place on August 29, a very important date. Censorinus also said that in his own time (A.D. 238) the 1st of Thoth of the vague year fell on June 25. Fig. 5 will show the connection of these three dates in reference to the vague year. The relations of the statements made as to the years 139 and 238 are very clearly discussed by Dr. Oppolzer.

Oppolzer, then, being satisfied as to the justice of taking the year 139 A.D. as a time of coincidence of the fixed and vague years—the latter being determined alone by the heliacal rising of Sirius, and, be it remembered, not by the solstices—calculated with great fulness, using Leverrier's modern values, the years in which, in the various Egyptian latitudes, chiefly taking Memphis (lat. 30°) and Thebes (lat. 25°), the coincidence between the two Thoths occurred in the previous periods of Egyptian history. He finds these dates for latitude 30° as follow :—

	Julian year.	Historical year.[1]
0	−4235	4236
1	−2774	2775
2	−1316	1317
3	+ 139	139
4	+1591	1591
5	+3039	3039

Now the date which Oppolzer gives for the coincidence which is nearest the date we had previously determined at 270 B.C. is 139 A.D. There is a difference of 409 years.

The question is, Can this fundamental difference be explained ? I think it can.

In the first place, it is beyond doubt that, in the interval between the Ramessids and the Ptolemies, the calendar, even supposing the vague year to have been used and to have been retained, had been fundamentally altered, and the meanings of the hieroglyphics of the tetramenes had been changed—in other words, the designations of the three seasons had been changed.

On this point I quote Krall in a note.[2]

The three hieroglyphic signs used for the tetramenes are supposed to represent water, flowers, and a barn, and the natural order would be that the first should represent the inundation, the second the sowing which succeeds it, and the last harvest time. If this be conceded, the initial system would have had the month Thoth connected with the water sign, as Thoth in early Egyptian times was the first inundation month. But in the times of the Ramessids even this is not so. Thoth has the sowing sign assigned to it. In the time of the Ptolemies the flood is no longer in Thoth, but in Pachons, and Pachons has the barn sign attached to it, while the month Thoth is marked by the water sign, thereby bringing back the hypothetical relation *between the name of the month and the sign*, although, as we have seen, Thoth is no longer the flood month.

Egyptologists declare that all or at least part of this change took place between the periods named ; they are undoubtedly justified as regards a part.

At one point in this interval we are fortunately supplied with some precise information. In the year 238 B.C. a famous decree was published, variously called the decree of Canopus and the decree of Tanis, since it was inscribed on a stone found there.

It is perfectly clear that one of the functions of this decree was to change, or to approve an already made change in, the designation of the season or tetramene in which the inundation commenced, from Thoth to Pachons.

Another function was to establish a fixed year, as we shall see presently. We must assume then that a vague year was in vogue prior to the decree. Now the decree tells us that at its date the heliacal rising of Sirius took place on 1 Payni. Assuming that this date had any relation to the system we have been considering, the cycle to which it belonged must have begun

Days.	
5	Epacts
30	Mesori
30	Epiphi
30	Payni
95 × 4 = 380 years previously ; that is, in the year 618 B.C.	

Now here at first sight it would seem that the Sothic cycles we have been considering have no relation to the one now in question ; for, according to my view, the last Sothic cycle began in 1728 B.C.

A little consideration, however, will lead to the contrary view, and show that the time about 600 B.C. was very convenient for a revision of the calendar.

In the first place nearly a month now elapsed between the coming of the flood and the heliacal rising ; and in the second, by making the year for the future *to begin with the flood*, a change might be made involving tetramenes only.

Thus, commencement of cycle	1728 B.C.
Epacts	5
Two tetramenes	240
Month between flood and rising of Sirius	30[1]
	275 × 4 = 1100
	628 B.C.

Nor is this all. A very simple diagrammatic statement will show what might also have happened about 618 B.C.

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[1] It should be observed that a distinction is made between the Julian and the historical year. This comes from the fact that when astronomical phenomena are calculated for dates B.C., it must be remembered that chronologists are in the habit of designating by 1, or rather by −1, the first year which precedes the instant of time at which the chronological year commenced, while astronomers mark this year in their tables by 0. It follows, therefore, that the rank of any year B.C. is always marked by an additional unit in the chronological dates. For the Christian era, of course, chronologists and astronomers work in the same way. The following table, given by Biot, exhibits the connection between these two methods. In the latter Biot shows the leap-years marked B, and the corresponding years in the Scaligerian chronological period are also given.

Dates of Julian Years commencing on January 1.

According to Chronologists.	According to Astronomers.	Corresponding years of the period of Scaliger.
−6	−5	4708
−5B	−4B	4709
−4	−3	4710
−3	−2	4711
−2	−1	4712
−1B	−0B	4713B
Physical instant when the era commenced.		
+1	+1	4714
+2	+2	4715
+3	+3	4716
+4B	+4B	4717B
+5	+5	4718

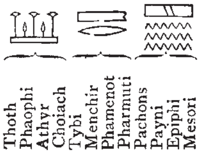
[2] *Loc. cit.* p. 29. "It is well known that the interpretation of the seasons and the months given by Champollion was opposed by Brugsch, who propounded another, which is now universally adopted by experts. Something has happened here which is often repeated in the course of Egyptian history—the signs have changed their meaning. Under the circumstance that the vague year during 1461 years wanders through the seasons in a great cycle, it is natural that the signs for the tetramenes should have changed their significations in the course of millenniums.

"While Thoth was the first month of the inundation in the documents of the Thutmosids and Ramessids, we have in the time of the Ptolemies the month Pachons as the first month of the flood season. Whilst Brugsch's explanation is valid for the time of the Ramessids, it is not so for that of the Ptolemies, to which Champollion's view is applicable."

[1] Probably too great a value by 2 or 3 days.

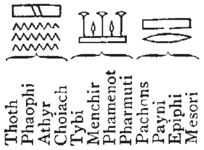
if a reformer of the calendar (and one especially of conservative tendencies) appeared upon the scene, who believed that the ancient sign for the inundation-tetramene was the water sign, and that the ancient name was Thoth. Finding the cycle beginning in 1728 with the signs as shown—

1728
B.C.



when starting fresh, he would seize the opportunity of effecting a change, not only by dealing with a tetramene, but he would change the names of the tetramenes allocated to the signs.

B.C.
618



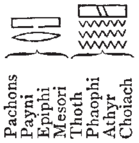
As Krall remarks, it was almost merely a question of a change of the sign! It really was more, because the new tetramene began with the flood.

Assuming this, we can see exactly what was done in 238 B.C., *i.e.* about 380 years later. We have seen that the 380 years is made up of

5 Epacts
30 Mesori
30 Epiphi
30 Payni
—
95 × 4 = 380

the heliacal rising of Sirius occurring on 1 Payni, having swept backwards along the months in the manner already explained. We had then—

B.C.
238



&c.

To sum up, so far as we have gone we have the three inscriptions at Philæ, Elephantine, and the still more ancient one of Pepi, indicating on the simple system we have suggested beginnings of Sothic cycles on the 1st Thoth about the years

270 }
1728 } B.C.
3192 }

On the other hand, we have the decree of Canopus, giving us by exactly the same system a local revision of the Calendar about 600 B.C. I say *about* 600 B.C. because it must be remembered that a difference of 2½ days in the phenomena observed will make a difference of 10 years in the date, and we do not know in what part of the valley the revision took place, and therefore at what precise time in relation to the heliacal rising the Nile-rise was observed.

Whenever presumably it took place, New Year's day was reckoned by the Flood, and the rising of Sirius followed nearly, if not quite, a month afterwards. The equivalent of the old 1st Thoth was therefore 1 Payni. In months, then, the old 1st Thoth was separated from the new one (= 1 Payni) by 3 months (Payni, Mesori, Epiphi) and the Epacts.

In this way, then, we can exactly account for the difference of 409 years referred to above as the dates assigned by Censorinus and myself for the beginning of the Sirius cycle.

Difference between 270 and 239 = 31 years.
3 months = 90 days × 4 = 360 ,,
5 epacts × 4 = 20 ,,
—
411 ,,

The difference of two years is equal only to half a day!

It seems, then, pretty clear from this that the suggestion I have ventured to make on astronomical grounds may be worth consideration on the part of Egyptologists. If our inquiries have really led us to the true beginnings of the Sothic periods, it is clear that those who informed Censorinus that the year 139 A.D. was the end of a cycle omitted to tell him what we now can learn from the decree of Tanis.

J. NORMAN LOCKYER.

(*To be continued.*)

TECHNOLOGICAL EXAMINATIONS.

THE report of the results of the Technological Examinations, held this year under the direction of the City and Guilds of London Institute, has a special interest, seeing that after this year the system of payment on results in connection with all classes outside the Metropolis will be discontinued. There is no doubt that the offer of payment to teachers helped very greatly in 1879 to stimulate the formation of technical, as distinct from science, classes, and the great extension of this work of the Institute is largely due to the offer then wisely made of contributing towards the cost of instruction. The tables furnished in the report, and the diagram of results, are very interesting as showing the great development of these trade classes. Since 1880 the number of candidates for examination has increased more than tenfold, the numbers being 816 in 1880 and 8,534 in 1892. In 1885 there were 263 technological classes in different parts of the country, and in the session 1891-2 this number had increased to 610. There is, of course, a corresponding increase in the number of students in attendance at these classes. In 1881 the number of students was 2,500, this year it was 16,565. This record of progress is certainly satisfactory, and particularly so, seeing that prior to 1891 there was no sort of organization to carry on the work of directing and assisting technical classes for artisans in different parts of the country. As a pioneer movement, the work of the City Guilds Institute has been eminently successful, and many of the Technical Schools which have now been brought under the control of County Councils undoubtedly owe their origin to the technological classes promoted by the City Guilds. The question now demanding attention is the future of these classes. Much is to be said in favour of associating them more closely with the science classes, which are held in the same schools; but what is wanted for the permanent improvement of such classes is a system of efficient inspection by persons competent to advise County Councils with respect to the important work now under their control.

From the report and programme it appears that year by year the Institute adds to the extent and efficiency of its examinations by the introduction of new subjects and of practical tests. Practical examinations were held this year for the first time in photography, goldsmiths' work, boot and shoe manufacture, and in wood-working in connection with the examination in manual training for teachers of public elementary schools. This last examination is somewhat different in kind from the other examinations of the Institute. It is not a trade examination. Its purpose seems to be to encourage instruction of a distinctly educational character. Moreover, it is a